In the United States Court of Federal Claims

OFFICE OF SPECIAL MASTERS
No. 17-1926V
Filed: March 21, 2025

AMANDA TRIPP,

Petitioner,

v.

SECRETARY OF HEALTH AND HUMAN SERVICES,

Respondent.

Special Master Horner

Verne E. Paradie, Jr., Paradie, Rabasco & Seasonwein, Lewiston, ME, for petitioner.
Madelyn Weeks, U.S. Department of Justice, Washington, DC, for respondent.

DECISION[1]

On December 12, 2017, petitioner, Amanda Tripp, filed a petition for compensation under the National Childhood Vaccine Injury Act, 42 U.S.C. § 300aa-10, *et seq.* (2012),[2] alleging that her receipt of an influenza ("flu") vaccination on March 21, 2016 caused her to suffer ataxia, speech difficulties, abnormal mental status, and severe weakness, diagnosed as a post-vaccination cerebellitis. (ECF No. 1.) For the reasons discussed below, I find that petitioner is *not* entitled to compensation.

I. Applicable Statutory Scheme

Under the National Vaccine Injury Compensation Program, compensation awards are made to individuals who have suffered injuries after receiving vaccines. In general, to gain an award, a petitioner must make a number of factual demonstrations,

[1] Because this document contains a reasoned explanation for the action taken in this case, it must be made publicly accessible and will be posted on the United States Court of Federal Claims' website, and/or at https://www.govinfo.gov/app/collection/uscourts/national/cofc, in accordance with the E-Government Act of 2002. 44 U.S.C. § 3501 note (2018) (Federal Management and Promotion of Electronic Government Services). **This means the document will be available to anyone with access to the internet.** In accordance with Vaccine Rule 18(b), Petitioner has 14 days to identify and move to redact medical or other information, the disclosure of which would constitute an unwarranted invasion of privacy. If, upon review, I agree that the identified material fits within this definition, I will redact such material from public access.

[2] Within this decision, all citations to § 300aa will be the relevant sections of the Vaccine Act at 42 U.S.C. § 300aa-10-34.

including showing that an individual received a vaccination covered by the statute; received it in the United States; suffered a serious, long-standing injury; and has received no previous award or settlement on account of the injury. Finally – and the key question in most cases under the Program – the petitioner must also establish a *causal link* between the vaccination and the injury.

In some cases, the petitioner may simply demonstrate the occurrence of what has been called a "Table Injury." That is, it may be shown that the vaccine recipient suffered an injury of the type enumerated in the "Vaccine Injury Table," corresponding to the vaccination in question, within an applicable time period following the vaccination also specified in the Table. If so, the Table Injury is presumed to have been caused by the vaccination unless it is affirmatively shown that the injury was caused by some factor other than the vaccination. § 300aa-13(a)(1)(A); § 300aa-11(c)(1)(C)(i); § 300aa-14(a); § 300aa-13(a)(1)(B). In many cases, however, the vaccine recipient may have suffered an injury *not* of the type covered in the Vaccine Injury Table. In such instances, an alternative means exists to demonstrate entitlement to a Program award. That is, the petitioner may gain an award by showing that the recipient's injury was "caused-in-fact" by the vaccination in question. § 300aa-13(a)(1)(B); § 300aa-11(c)(1)(C)(ii). In that context, the presumptions available under the Vaccine Injury Table are inoperative. The burden is on the petitioner to introduce evidence demonstrating that the vaccination actually caused the injury in question. *Althen v. Sec'y of Health & Human Servs.*, 418 F.3d 1274, 1278 (Fed. Cir. 2005); *Hines ex rel. Sevier v. Sec'y of Health & Human Servs.*, 940 F.2d 1518, 1525 (Fed. Cir. 1991).

In this case, petitioner has alleged that the vaccination at issue caused cerebellitis, which is not listed on the Vaccine Injury Table relative to the flu vaccine.[3] Therefore, petitioner must meet the burden of proof for establishing causation-in-fact.

The showing of "causation-in-fact" must satisfy the "preponderance of the evidence" standard, the same standard ordinarily used in tort litigation. § 300aa-13(a)(1)(A); *see also Althen*, 418 F.3d at 1279; *Hines*, 940 F.2d at 1525. Under that standard, the petitioner must show that it is "more probable than not" that the vaccination was the cause of the injury. *Althen*, 418 F.3d at 1279. The petitioner need not show that the vaccination was the sole cause but must demonstrate that the vaccination was at least a "substantial factor" in causing the condition, and was a "but for" cause. *Shyface v. Sec'y of Health & Human Servs.*, 165 F.3d 1344, 1352 (Fed. Cir. 1999). Thus, the petitioner must supply "proof of a logical sequence of cause and effect showing that the vaccination was the reason for the injury[,]" with the logical sequence being supported by "reputable medical or scientific explanation." *Althen*, 418 F.3d at 1278; *Grant v. Sec'y of Health & Human Servs.*, 956 F.2d 1144, 1148 (Fed. Cir. 1992). Ultimately, petitioner must satisfy what has come to be known as the *Althen* test, which requires: (1) a medical theory causally connecting the vaccination and the injury; (2) a logical sequence of cause and effect showing that the vaccination was the reason for

[3] The expert medical opinion in this case does indicate that cerebellitis is a form of encephalitis. Encephalitis is a Table Injury for some vaccinations, but not the flu vaccine. 42 C.F.R. § 100.3(a).

the injury; and (3) a showing of proximate temporal relationship between vaccination and injury. *Id*.

A petitioner may not receive a Vaccine Program award based solely on his or her assertions, but must support the petition with either medical records or by the opinion of a competent physician. § 300aa-13(a)(1). Medical records are generally viewed as particularly trustworthy evidence, because they are created contemporaneously with the treatment of the patient. *Cucuras v. Sec'y of Health & Human Servs.*, 993 F.2d 1525, 1528 (Fed. Cir. 1993). However, medical records and/or statements of a treating physician's views do not *per se* bind the special master to adopt the conclusions of such an individual, even if they must be considered and carefully evaluated. § 300aa-13(b)(1). A petitioner may also rely upon circumstantial evidence. *Althen*, 418 F.3d at 1280. In that regard, the *Althen* court noted that a petitioner need not necessarily supply evidence from medical literature supporting petitioner's causation contention, so long as the petitioner supplies the medical opinion of an expert. *Id*. at 1279-80. While scientific certainty is not required, that expert's opinion must be based on "sound and reliable" medical or scientific explanation. *Boatmon v. Sec'y of Health & Human Servs*., 941 F.3d 1351, 1359 (Fed. Cir. 2019).

Cases in the Vaccine Program are assigned to special masters who are responsible for "conducting all proceedings, including taking such evidence as may be appropriate, making the requisite findings of fact and conclusions of law, preparing a decision, and determining the amount of compensation, if any, to be awarded." Vaccine Rule 3. Special masters must ensure each party has had a "full and fair opportunity" to develop the record but are empowered to determine the format for taking evidence based on the circumstances of each case. Vaccine Rule 3(b)(2); Vaccine Rule 8(a); Vaccine Rule 8(d). Special masters are not bound by common law or statutory rules of evidence but must consider all relevant and reliable evidence in keeping with fundamental fairness to both parties. Vaccine Rule 8(b)(1). The special master is required to consider "all . . . relevant medical and scientific evidence contained in the record," including "any diagnosis, conclusion, medical judgment, or autopsy or coroner's report which is contained in the record regarding the nature, causation, and aggravation of the petitioner's illness, disability, injury, condition, or death," as well as the "results of any diagnostic or evaluative test which are contained in the record and the summaries and conclusions." § 300aa-13(b)(1)(A). The special master is required to consider the entirety of record, draw plausible inferences, and articulate a rational basis for the decision. *Winkler v. Sec'y of Health & Human Servs.*, 88 F.4th 958, 963 (Fed. Cir. 2023) (citing *Hines*, 940 F.2d at 1528).

II. Procedural History

This case was initially assigned to different special master. (ECF No. 7.) Between December of 2017 and November of 2018, petitioner filed medical records marked as Exhibits 1-13, as well as an affidavit of petitioner. (ECF Nos. 1, 5-6, 11, 14, 21.) Respondent filed his Rule 4(c) Report in February of 2019. (ECF No. 24.) Respondent recommended against compensation because petitioner had not satisfied

the statutory severity requirement, failed to provide evidence to establish causation-in-fact, and failed to provide evidence that she suffered a cognizable injury, as opposed to a series of symptoms without any diagnosis. (*See id.* at 16-21.) Thereafter, additional medical records were filed in April of 2019 (Exhibits 14-15), and the case was reassigned to the undersigned in June of 2019. (ECF Nos. 25, 28.)

Initially, petitioner sought to support her claim by filing an expert report by neurologist Nizar Souayah, M.D., who opined that petitioner had suffered acute disseminated encephalomyelitis ("ADEM"), rather than cerebellitis. (ECF No. 30.) However, petitioner was dissatisfied with Dr. Souayah's opinion and ultimately proceeded with a different neurology expert, Andrew Goodman, M.D., who based his opinion on a diagnosis of acute cerebellitis, as had been assessed at Massachusetts General Hospital. (ECF No. 42; Ex. 16; *see also* Exs. 17-35 (supporting literature).) Petitioner later filed an unopposed motion to strike Dr. Souayah's opinion from the record, which was granted. (ECF No. 79.) Respondent filed responsive reports by neurologist Norman Werdiger, M.D. (ECF No. 52; Exs. A-B) and immunologist S. Mark Thompkins, Ph.D. (ECF No. 53; Exs. C-D). Drs. Goodman and Thompkins also filed supplemental reports. (ECF No. 61 (Ex. 36); ECF No. 66 (Ex. E).)

An entitlement hearing was held on July 18 and 19, 2023. (*See* Transcript of Proceedings ("Tr."), at ECF Nos. 97-98.) Petitioner, Dr. Goodman, Dr. Werdiger, and Dr. Thompkins testified. In connection with the hearing, the parties filed additional exhibits, marked as Exhibits 37-41 and Exhibits G-M. (ECF Nos. 82, 86, 92, 99.) The parties filed post hearing briefs in November of 2023. (ECF Nos. 101-02.)

Accordingly, the parties have had a full and fair opportunity to develop the record, and this case is ripe for resolution of entitlement.

III. Factual History

a. Medical Records

Petitioner saw her primary care physician ("PCP"), Joanne Rulf, D.O., at Central Maine Medical Center on March 21, 2016, for an annual physical without concerns. (Ex. 2, p. 26.) Petitioner reported that she had been going to therapy for the past year to address her relationship with her mother, who had recently passed away. (*Id.*) It was noted that the situation was "complicated" and "[v]ery stressful." (*Id.*) Petitioner had started seeing a naturopath and was taking "herbal and homeopathic 'adrenal' supplements," including "supplements for grief." (*Id.*) Petitioner's physical examination was normal. (*Id.* at 23.) It was noted that she was "alert and cooperative; normal mood and affect; normal attention span and concentration." (*Id.*) As current problems, Dr. Rulf noted cough, bipolar affective disorder, anxiety disorder, migraine, and migraine with aura. (*Id.* at 25.) Dr. Rulf noted a history of untreated mental health issues and assessed petitioner with "grief reaction," but petitioner declined a psychiatry referral. (*Id.* at 23, 25.) Petitioner received the subject flu vaccine during this visit. (*See id.* at 23; Ex. 11, p. 3.)

Petitioner went to the Emergency Department at Central Maine Medical Center on March 23, 2016. (Ex. 13, p. 18.) Stacey Norelka, P.A., conducted the examination. (*Id.*) Petitioner reported a twelve-hour history of vomiting and diarrhea. (*Id.*) She also stated that she had recently seen her PCP for an upper respiratory infection and received a flu vaccine. (*Id.*) Petitioner claimed that she began feeling flu-like symptoms of fever and body aches in the middle of the night after receipt of the flu vaccine. (*Id.*) She began vomiting the following morning. (*Id.*) Petitioner's physical and neurological examinations were normal. (*Id.* at 22-23.) Specifically, her speech and coordination were observed as being normal. (*Id.*) Petitioner's blood work revealed, in pertinent part, elevated neutrophils and low lymphocytes. (*Id.* at 23.) She was diagnosed with "viral syndrome" and given Zofran and IV fluids, which caused her vomiting to subside. (*Id.* at 24.)

On March 28, 2016, petitioner returned to the Emergency Department at Central Maine Medical Center with complaints of nausea, vomiting, headache, cough, and diarrhea. (Ex. 13, p. 1.) This time, petitioner saw Richard D'Alessandro, M.D. (*Id.*) Petitioner reported that the vomiting and diarrhea resolved the day prior, but she still felt nauseous. (*Id.*) She also reported "nonspecific dizziness and increased anxiety." (*Id.*) She denied having vision changes, focal peripheral neurological symptoms, confusion, or balance problems, but complained of a constant, non-radiating frontal headache. (*Id.*) It was noted that petitioner was "under a great deal of stress . . . after the death of her mother," that she was in an abusive relationship, and that she was dealing with "avoided issues." (*Id.* at 2.) It was further noted that petitioner "has had bipolar/depression problems for years" and that she had previously taken various medication to no avail. (*Id.*) Petitioner reported that she would lay in bed and sleep for the majority of the day. (*Id.*) At times, she would get up and pace or go outside to play with her children and go on walks. (*Id.*) During her physical and neurological examination, Dr. D'Alessandro noted that petitioner was depressed and anxious with mild distress. (*Id.* at 4.) Her speech and coordination were normal. (*Id.*) Though capable, petitioner was reluctant to ambulate without assistance. (*Id.*) There was no presence of ataxia or abnormal reflexes despite petitioner's complaints of dizziness. (*Id.*) Petitioner's blood work was unremarkable. (*Id.* at 5-6.) Dr. D'Alessandro stated that it was unlikely that petitioner's symptoms were due to a central nervous system ("CNS") infection like meningitis or encephalitis. (*Id.*) Instead, he suspected that a majority of her symptoms were "due to her stress and mental illness." (*Id.* at 5.) He explained that she suffers from depression and anxiety and that she had recently been under "many stressors." (*Id.*) Petitioner was diagnosed with dizziness, depression, and "anxiety reaction." (*Id.* at 7.)

Petitioner went to the Emergency Department at St. Mary's Regional Medical Center ("St. Mary's Regional") on March 29, 2016. (Ex. 12, p. 41.) Allison Brewer, M.D. conducted the examination. (*Id.*) Petitioner reported a slight headache and difficulty with articulation of speech. (*Id.*) Petitioner stated that she went to the Emergency Department at Central Maine Medical Center the day prior with "speech and ambulation

changes"[4] and was told that her symptoms could be due to a "stress reaction." (*Id.*) At St. Mary's Regional, petitioner appeared "a little more stable on her feet"; however, her family reported that they had to catch her to prevent her from falling two days earlier. (*Id.*) She had a slight headache but no confusion or vision changes. (*Id.*) Her neurological examination uncovered slow, dysarthric speech but no ataxia. (*Id.* at 43.) She was able to stand with a wide based stance and walk, albeit slowly, without assistant. (*Id.*) It was noted that petitioner was answering questions easily and with no confusion. (*Id.*) A urine toxicology screen was negative. (*Id.*) Dr. Brewer opined that it was unlikely that petitioner suffered from encephalitis or meningitis. (*Id.* at 44.) Though petitioner's physical examination was abnormal, Dr. Brewer opined that her condition was "more consistent with possible stress reaction." (*Id.*) She recommended that petitioner obtain a "crisis and psychological evaluation in case this is possible stricture and stress reaction while undergoing continued workup for possible cause" in light of how much stress petitioner had endured after losing her mother. (*Id.*) Dr. Brewer also informed petitioner about "stress manifestations for physical behavior." (*Id.*) Dr. Brewer's impression was "[e]pisode of change in speech." (*Id.*)

When petitioner presented to Dr. Rulf on March 30, 2016, she was wheelchair bound and complaining that she had "not been the same since [she] got the flu shot." (Ex. 2, p. 29.) After recounting the clinical course since her flu vaccination, petitioner reported impaired speech and ability to walk. (*Id.*) She complained of poor balance, dizziness, headaches, and problems with spatial awareness but no confusion. (*Id.*) Dr. Rulf noted that petitioner was dealing with untreated bipolar disorder and stress from her mother passing away. (*Id.*) During her neurological examination, it was noted that petitioner's cranial nerves were normal and there was no sign of dysarthria, but her speech was slowed and monotone. (*Id.* at 28.) Her gait was "unsteady and stumbling"; however, she was able to "spin around quickly and land precisely in her wheelchair" when about to fall. (*Id.*) Petitioner could not comply with strength or cerebellar testing, but she appeared stable. (*Id.*) Dr. Rulf indicated that she was "unable to find a distinct neurologic deficit." (*Id.*) Dr. Rulf referred petitioner for neurology and psychology evaluations. (*Id.*)

Later that day, petitioner returned to St. Mary's Regional with complaints of "persistent neurological changes." (Ex. 12, p. 26.) Petitioner reported that, ten days prior, she became symptomatic with unsteady gait and gastrointestinal issues, as well as speech disturbances. (*Id.* at 15.) As the days went on, petitioner reported that her gastrointestinal issues were improving but her speech and gait issues persisted. (*Id.*) She presented with complaints of headache and photophobia. (*Id.* at 26.) She also reported pain and rash over her right thenar eminence. (*Id.*) During her neurological examination, it was noted that petitioner's gait was ataxic and unsteady, that her speech was impaired, and that her deep tendon reflexes and strength were decreased on the right side. (*Id.* at 27-29.) The initial impression was acute episode of change in speech

[4] Despite petitioner's report otherwise, the medical records from her March 28, 2023 visit to Central Maine Medical Center indicate that her speech and coordination were normal. (Ex. 13, p. 4.) Moreover, she did not complain of changes in speech or ambulation during that visit. (*Id.* at 1.)

due to "viral prodrome after flu vaccine"; however, the differential diagnoses included, *inter alia*, ADEM and atypical multiple sclerosis presentation. (*Id.* at 25, 29.)

Petitioner was admitted for a neurology consultation and further testing. (Ex. 12, pp. 24-25.) Because petitioner's cerebrospinal fluid ("CSF") revealed lymphocytosis and elevated red and white blood cells, petitioner was started empirically on the following antibiotics and antivirals: acyclovir, ceftriaxone, and vancomycin. (*Id.* at 24-25, 28-29.) During petitioner's neurology consultation on March 31, 2016, it was noted that petitioner had been largely dysarthric and only intermittently cooperative with answering questions since her admission. (*Id.* at 15-16.) Her neurologist noted that the CSF results were abnormal with mild lymphocytic pleocytosis that could be indicative of an inflammatory or infectious cause, in particular viruses or atypical bacteria. (*Id.* at 17.) A possible reaction to the herbal supplements that she was taking, as well as autoimmune causes, were being explored. (*Id.*) Specifically, her treaters were considering "the possibility of a transient autoimmune encephalitis related to the flu vaccine or the gastrointestinal illness that followed." (*Id.*) Although petitioner was not exhibiting "a classic presentation for HSV encephalitis," she was being empirically treated for that pending further test results. (*Id.*) Petitioner was also being empirically treated for more traditional bacterial infections; however, these conditions seemed unlikely given her presentation. (*Id.*) The antibiotics and antivirals were subsequently discontinued when petitioner's test results, including a viral encephalitis panel, came back negative. (Ex. 1, p. 30.)

On April 1, 2016, petitioner underwent a psychiatry evaluation, during which it was noted that petitioner "had several episodes of extreme agitation," which escalated to physical violence, prior to her hospitalization. (Ex. 12, p. 7.) Petitioner's relationship with her late mother was described as "very conflicted" with "significant abuse" by way of Munchausen Syndrome by Proxy. (*Id.* at 8; Ex. 1, p. 7.) On examination, petitioner was poorly coordinated with minimal strength in her bilateral hands and right food. (Ex. 12, p. 7, 13.) Her speech had "an unusual, slow cadence" that was "somewhat dysarthric and difficult to understand." (*Id.* at 7.) However, petitioner was fully alert and oriented to date, place, situation, and recent events. (*Id.* at 7, 13.) Petitioner was assessed with "significant recent stressors that may be leading to physiological manifestations of psychological issues (conversion reaction)." (*Id.* at 13.) Although a full neurology work up was still pending at this time, it was noted that petitioner's treaters were struggling to find "any known neurological condition that could cause [the] type of dysarthria and apraxia/weakness" that she was exhibiting. (*Id.*) A trial of high dose benzodiazepines was suggested. (*Id.*)

Petitioner underwent further imaging and laboratory testing. Her EEG, MRI of the brain and abdomen, and CT scan of the pelvis were normal. (Ex. 12, pp. 16, 23.) By April 4, 2016, petitioner's movements and speech remained dysarthric and sluggish. (Ex. 1, p. 116.) Petitioner treating neurologist explained that there was "no evidence of an organic etiology" and referred petitioner to psychiatry for further care. (*Id.* at 167.) Petitioner agreed to be transferred to the psychiatric unit at St. Mary's Regional and was placed on Seroquel. (*Id.* at 116.) On April 5, 2016, petitioner's speed was noted to be

"telegraphed, slow and slightly dysarthric." (Ex. 12, pp. 1-2.) Her movements were also slow and poorly coordinated. (*Id.*) The differential diagnosis was conversion reaction based on petitioner's recent, significant psychological stressors; completely negative neurological work up; and "atypical neurological symptoms." (*Id.* at 2.) "[M]ajor depressive disorder, recurrent, severe (versus bipolar disorder)" was also included on the differential. (*Id.*)

Petitioner was subsequently transferred back to the medical floor to begin intravenous immunoglobulin ("IVIg") treatment after it was suggested that she might have "an atypical presentation of post-vaccination encephalitis," Miller Fisher syndrome ("MFS"), or Bikerstaff encephalitis. (Ex. 1, pp. 78, 193, 191.) Although MFS and Bikerstaff encephalitis, which are overlapping expressions of the anti-GQ1b antibody syndrome and linked to Guillain-Barré syndrome ("GBS"), were suggested based on petitioner's continued ataxic gait, petitioner did not have the ophthalmoplegia that is typically associated with these syndromes. (*Id.* at 191, 193.) It was later noted that the relationship between petitioner's flu vaccination and "the sudden appearance of symptoms the next day is unclear," given that "it takes about two weeks to mount an antibody response" to the flu vaccine. (*Id.* at 13.) It was further stated that petitioner's presentation did not meet the criteria for GBS. (*Id.*)

Petitioner was empirically started on a five-day course of IVIg. (Ex. 1, pp. 6-7.) Over the course of this treatment, petitioner saw some improvement in her ambulatory ability; however, she still had significant problems with speech, upper extremity ataxia, and intermittent weakness. (*Id.* at 7.) Petitioner's test results for the infectious disease workup were negative, and her neurological findings remained "essentially stable." (*Id.*) Although it was determined that petitioner was improving enough to be transferred to rehabilitation, the rehabilitation center refused to admit her for fear that she was suffering from conversion disorder. (*Id.*) Petitioner's family was not comfortable with her being discharged without a specific diagnosis and requested that she be transferred to another facility for a second opinion. (*Id.*)

On April 14, 2016, petitioner was transferred to Massachusetts General Hospital. (Ex. 3, p. 14.) Petitioner's relevant medical history was recounted in the Neurology Admission Note, including a description of petitioner "throwing things" and her emotions "presenting as physical problems." (*Id.* at 91.) On examination, petitioner was alert and appropriately interactive despite slow speech with a monotonic, scanning quality. (*Id.* at 92.) Her movements were slow, and her gait was wide-based and unsteady. (*Id.*) The primary diagnostic question was whether petitioner's atypical presentation, including lymphocytic pleocytosis on CSF but normal MRI, was consistent with post-vaccination immune-mediated cerebellitis with an apparent functional overlay. (*Id.*) It was also noted that psychological stressors could be a contributing factor. (*Id.*) Repeat testing was ordered to check for inflammation with a plan to hold off on immunomodulatory therapy if the pleocytosis had resolved. (*Id.*)

Petitioner participated in several sessions of occupational, speech, and physical therapies. (Ex. 3.) Petitioner's oral motor examination revealed "intact range of motion,

sensation, and strength with timely activation and movement of muscles for speech and swallowing during isolated testing." (*Id.* at 81.) As such, her oral motor examination and swallowing functions appeared "inconsistent with motor speech disturbance and not entirely consistent with a cerebellar or dysarthria syndrome." (*Id.*) By April 21, 2016, it was noted that petitioner's behavior was "slightly improved." (*Id.* at 33.) However, it was also noted that her providers did not believe that her symptoms were "fully volitional" and that they opined that a "component of conversion seems present." (*Id.*) After a five-day course of Solu-Medrol, it was reported that petitioner was slowly improving. (*Id.* at 125.)

Petitioner was discharged from Massachusetts General Hospital on April 22, 2016. (Ex. 3, p. 22.) Petitioner's discharge examination indicated that her speech was "perhaps slightly faster" but still slow, monotone, and slurred. (*Id.*) Petitioner was referred to New England Rehabilitation Hospital of Portland. (*Id.* at 23.) The discharge summary noted that petitioner symptoms began "in March 2016 following influenza vaccine and possible viral GI illness." (*Id.* at 25.) Although her presentation was confusing, she was thought to possibly suffer from post-vaccination or post-viral syndrome, such as cerebellitis, with functional overlay. (*Id.*) Acute onset of symptoms within a week following the influenza vaccine supported a post-vaccination syndrome, while her nausea and vomiting pointed to the possibility of a viral infection and subsequent post-viral cerebellitis. (*Id.*) However, there was "[n]o outright convincing evidence clinically," just "suggestive findings of inflammation on CSF with pleocytosis" and "some clinical signs including ataxia and dysmetria." (*Id.*) There was some concern of a functional overlay that exacerbated the symptoms, as evidenced by "inconsistent findings or neurological examinations and mood symptoms, in the context of psychological stressors." (*Id.*) It was noted that extensive work up was unremarkable. (*Id.*) Ultimately, petitioner was assessed with cerebellar disease and mood disorder. (*Id.*)

On April 22, 2016, petitioner was admitted for inpatient rehabilitation, where she completed three hours of therapy, five days a week, and "steadily improved." (Ex. 4, pp. 5, 19.) It was noted that she struggled with dysarthria and "psychomotor retardation," but she did not have problems with ataxia. (*Id.* at 5.) By May 10, 2016, petitioner was ambulatory and her dysarthria was "markedly improved. (*Id.* at 6.) Her diagnoses on discharge were cerebellitis and difficulty walking. (*Id.* at 4.)

Petitioner returned at Central Maine Medical Center on May 18, 2016, reporting improvement in her speech but continued issues with weakness, coordination, balance, memory, and concentration. (Ex. 2, pp. 32, 34-35.) Her gait was unsteady, and she presented in a wheelchair. (*Id.*) She further reported "feeling high anxiety" as a result of "severe family stress," which "was made worse by her altered mental state and speech disturbance." (*Id.* at 34.) She was also unable to sleep and lacked an appetite. (*Id.*) It was unclear whether the cause of her symptoms was some reaction to the flu vaccine or a conversion disorder. (*Id.*) Petitioner was assessed with altered mental status of unclear etiology, speech disturbance, anxiety, and insomnia. (*Id.* at 31.) She

was advised to continue therapy and prescribed Hydroxyzine for the anxiety and insomnia. (*Id.*)

On July 25, 2016, petitioner visited Maine Medical Partners Neurosurgery and Spine and reported that she had made noticeable progress with regard to her gait and balance. (Ex. 6, p. 1.) Despite continued struggles with dysarthria and dysphonia, she appeared to be "somewhat more intelligible than she had been." (*Id.*) Petitioner complained that her "mind feels blank" and displayed difficulty writing. (*Id.* at 2, 4.) There was evidence of dysmetria on her left side but not her right side. (*Id.* at 4.) Petitioner was diagnosed with post vaccination cerebritis, dysarthria, dysphonia, and cognitive impairments. (*Id.* at 1.) It was recommended that petitioner continue attending outpatient physical, occupation, and speech therapies and that petitioner make an appointment with a local neurologist. (*Id.* at 1-2.)

Petitioner spoke to a therapist on a regular basis between the months of May 2016 and August 2016. (Ex. 7.) Her last recorded appointment occurred on August 15, 2016. (*Id.* at 18.) Though she was still coping with the loss of her mother, it was reported that petitioner was alert and interactive with an appropriate affect. (*Id.*)

In September 2017, petitioner was informed that she was at risk of glaucoma. (Ex. 10, pp. 4, 9.) When she returned to see Dr. Rulf, petitioner indicated her fear that the glaucoma was "due to the cerebellitis." (Ex. 15, p. 1.) Dr. Rulf's assessment was anxiety and headache. (*Id.* at 2.) However, altered mental state and speech disturbance were listed as ongoing problems. (*Id.*)

b. Testimony

Petitioner testified during the hearing. (Tr. 6-82.) However, her testimony is generally not helpful in resolving this case. Petitioner's testimony was not entirely consistent with her medical records; however, she explained that she has memory difficulties as a result of her injuries, does not have a good memory of her treatment, and does not dispute what is in her medical records. (*Id.* at 8-10, 27, 57.) Her expert, Dr. Goodman, testified that his medical opinion is based on petitioner's medical records and that he would not support vaccine causation of her condition based on what petitioner described in her testimony. (*Id.* at 93-94, 99-100.)

IV. Expert Opinions

a. Petitioner's Expert

i. Andrew D. Goodman, M.D., FAAN, FANA[5]

[5] Dr. Goodman received his medical degree from Rutgers New Jersey Medical School in 1979 before going on to complete residencies in internal medicine and neurology at Mount Sinai Medical Center in 1980 and 1983, respectively. (Ex. 16(b), p. 1; Tr. 85.) He has been board certified by the American Board of Psychiatry and Neurology since 1986. (Ex. 16(b), p. 1; Tr. 86.) In 1988, Dr. Goodman

Dr. Goodman filed two reports (Exs. 16, 36), and he also testified at the entitlement hearing, during which he was presented without objection as an expert in neurology.[6] (Tr. 92.) Dr. Goodman opined that petitioner suffered acute cerebellitis caused by her flu vaccination, characterizing his opinion as being in agreement with the neurology team at Massachusetts General Hospital. (*Id.* at 94, 104-05.) However, Dr. Goodman stressed that his opinion is not limited to merely endorsing the assessment from Massachusetts General Hospital. (*Id.* at 160-61.) During the hearing, Dr. Goodman characterized his opinion as resting on the following points: The Massachusetts General Hospital assessment, including the diagnosis, neurologic findings, and ruling-out of other etiologies; clinical manifestations; persistent lymphocytic pleocytosis in the cerebral spinal fluid confirming an inflammatory condition of the central nervous system; response to IVIg treatment; and the clinical course of events, including a post-vaccination onset. (*Id.* at 95-96, 102-04, 112-15, 118, 121-22, 148, 161.) Dr. Goodman based his assessment on the assumption that onset of petitioner's cerebellitis occurred at least two-days post-vaccination. (*Id.* at 99, 106, 173.)

Dr. Goodman explained that acute cerebellitis, which is essentially a form of encephalitis affecting the cerebellum in particular, is one form of the clinical syndrome of acute cerebellar ataxia that is distinguished from the broader syndrome by having an inflammatory cause. (Tr. 101-02, 158-59.) According to Dr. Goodman, it typically occurs following viral infections and vaccinations in children. (Ex. 16, p. 3; Tr. 100-02.) It is a rare condition among adults. (Tr. 107.) When acute cerebellitis occurs in adults, it is most often the result of "para-infectious and paraneoplastic immune-mediated causes." (Ex. 16, p. 3.) Flu infections, particularly influenza A (H1N1)pdm09, are among the published causes of acute cerebellitis. (*Id.* (citing A. Van Samkar et al., *Acute Cerebellitis in Adults: A Case Report and Review of the Literature*, 10 BMC RES. NOTES 610 (2017) (Ex. 34)).) There are also published case reports of flu vaccine-induced acute cerebellitis in both adults and children. (*Id.*; *see also* Kang Min Park et

completed a fellowship in the neurology branch of the National Institutes of Health. (Ex. 16(b), p. 1; Tr. 85.) From 1988 to 1994, Dr. Goodman was an assistant professor in the Department of Neurology at the University of Rochester School of Medicine and Dentistry ("University of Rochester"). (Ex. 16(b), p. 1.) Also in 1988, Dr. Goodman became a consulting neurologist at the National Multiple Sclerosis Society Clinic; however, by 1991, he had transitioned to a position as a consulting neurologist at Monroe Community Hospital. (*Id.*) At that time, Dr. Goodman also became Chief of the Neuroimmunology and Multiple Sclerosis Division at the University of Rochester. (*Id.*; Tr. 84.) The following year, in 1992, he became Director of the Rochester Multiple Sclerosis Center at Strong Memorial Hospital, and in 1993, Dr. Goodman became a consulting neurologist at the Rochester Area Multiple Sclerosis/Park Ridge Adult Day Health Program. (Ex. 16(a), p. 2.) Starting in 1994, Dr. Goodman maintained a position as an Associate Professor in the Department of Neurology at the University of Rochester before being promoted to Professor in 2006. (*Id.*; Ex. 16(b), pp. 1-2; Tr. 84.) Dr. Goodman has authored several peer-reviewed articles, book chapters, review articles, and letters, primarily focused on researching the underlying pathogenesis of CNS demyelinating disease, such as multiple sclerosis. (Ex. 16(b), pp. 12-19; Ex. 16(a), p.1.)

[6] However, respondent objected to petitioner's proffer of Dr. Goodman as an expert in neuroimmunology. (Tr. 139-40.)

al., *An Elderly Case of Acute Cerebellitis After Alleged Vaccination*, 5 J. MOVEMENT DISORDERS 21 (2012) (Ex. 33)).)

With respect to clinical presentation, Dr. Goodman noted a review of acute cerebellitis in adults by Van Samkar et al., which was based on a comprehensive literature search and published in 2017. (Ex. 16, p. 4 (citing Van Samkar et al., *supra*, at Ex. 34).) He explained that the review included 32 studies describing 34 episodes of MRI-confirmed acute cerebellitis in adults, occurring between 1991 and 2016. (*Id.*) The majority of patients were female, and "[m]ore than 80% of patients presented with headache, nausea/vomiting and ataxia." (*Id.*) Altered consciousness was reported in about 29% of patients. (*Id.*) It was reported that 6 patients presented with headaches and nausea but without other neurological symptoms before subsequently returning with cerebellar signs. (*Id.*) CSF leukocytes varied widely among the subjects. Brain MRI showed abnormalities on the T1 sequence in about half of the cases (7 out of 13 patients, or 54%), while T2/fluid-attenuated inverse recovery (FLAIR) sequence, diffusion-weighted imaging (DWI)/apparent diffusion coefficient (ADC) sequence and contrast sequence showed abnormalities in about 80% of the cases. While there are various patterns of cerebellar involvement in the MRI of acute cerebellitis cases, the most common pattern is bilateral diffuse hemispheric abnormalities. (*Id.*)

Dr. Goodman agreed that MRI evidence is generally important in assessing cerebellitis, but opined that it is not dispositive. (Tr. 144-45, 147-48, 160.) Although the radiology report of petitioner's March 31, 2016 MRI indicated a normal scan, Dr. Goodman stressed that the treating neurologists specifically noted the presence of "overly prominent/full" cerebellar hemispheres, which, in the context of their diagnosis, he interprets as a finding that petitioner's cerebellum was swollen. (*Id.* at 109-11, 170-72.) The most common longer-term sequelae were cerebellar symptoms, such as dysarthria and ataxia. (Ex. 16, p. 4 (citing Van Samkar et al., *supra*, at Ex. 34).) After observing petitioner give testimony in this case, Dr. Goodman observed that petitioner's demonstrated speech difficulty is consistent with sequela of an injury to the cerebellum. (Tr. 122.)

Dr. Goodman explained that acute cerebellitis can be diagnosed "with history and detailed general and neurological examination" and that "[t]here are no specific markers of diagnosis in blood investigations." (Ex. 16, p. 4.) He stated that acute cerebellitis "may be thought of on clinical suspicion after evaluating the differential diagnosis for other serious illnesses," such as "toxic exposure, infections, and structural problems." (*Id.*) In petitioner's case, Dr. Goodman stressed that Massachusetts General Hospital ruled out meningitis, as well as malignancy and viral illness, as causes for petitioner's condition. (Tr. 95, 114-15.) He acknowledged that petitioner had reportedly suffered bronchitis prior to onset of her neurologic symptoms, which he agreed could implicate an infectious cause; however, he still opined that, although it is impossible to reach a definitive conclusion, a post-vaccinal process is more likely than a post-infectious

process, stressing there is no direct evidence of a viral infection.[7] (*Id.* at 116-17, 119-120.)

Dr. Goodman explained that the World Health Organization ("WHO") recommended that vaccines for use during the "2015-2016 influenza season (northern hemisphere winter)" contain, among other strands, an "A/California/7/2009 (H1N1)pmd09-like virus." (Ex. 16, p. 4.) This is notable because the vaccine received by petitioner necessarily contained the "influenza A(H1N1)pdm09 antigens that have been associated with neurological complications consequent to both naturally occurred influenza infections and those attributed to vaccination-induced immune-mediated conditions." (*Id.*) Dr. Goodman explained that, in the known cases of clinical and laboratory-supported acute cerebellitis after exposure to influenza A in adult individuals, an immune-mediated inflammatory mechanism, rather than direct viral infection of the cerebellum, is presumed in most, if not all, cases. (*Id.*)

> Although viral RNA of influenza viruses is rarely determined in the CSF in post-infectious cases[,] studies have reported that influenza-associated cerebellitis may occur with adaptive immune responses during the influenza infection due to the fact that increase proinflammatory cytokines have been found in the serum or CSF of patients.
>
> The pro-inflammatory cytokines that are produced by peripheral blood monocytes in cases of immune-mediated cerebellitis have included increased levels of serum IL-6, sTNFR1, and IL-10, CSF IL-6, and NF-kappaB.

(*Id.* at 4-5.) Dr. Goodman indicated that a number of autoantibody-associated cerebellar ataxias have in recent years been described as resulting from autoimmune inflammatory mechanisms and, specifically, "with systemic disease (autoimmune) or cancers (paraneoplastic)." (*Id.* at 5.) This bolsters the initial "inference of a temporally appropriate post-vaccination-induced mechanism of inflammation" in petitioner's case as extensive testing failed to detect any cancer, central nervous system infection, or other known autoantibodies. (*Id.*)

Dr. Goodman concluded that petitioner's neurological symptoms "were probably due to an unusual post-vaccination acute cerebellitis (an inflammatory condition involving the central nervous system)" that occurred within a month of her flu

[7] In the interest of completeness, I asked Dr. Goodman during the hearing whether it would be consistent with his theory to consider both the proposed infection and vaccination to have been causes of cerebellitis. (Tr. 123.) He indicated that it would be "plausible" or "possible" for an infection and vaccination to have acted synergistically. (*Id.* at 123-24.) However, he noted that he had not previously considered this possibility and characterized his explanation of the process by which that synergy would happen as "just speculation." (*Id.* at 124.) Although petitioners in this program need not prove vaccination to be the sole cause of their injury, *Shyface*, 165 F.3d at 1352, they do not meet their burden of proof by offering theories of causation that are merely "possible" or "plausible," *Boatmon*, 941 F.3d at 1360. Accordingly, Dr. Goodman's testimony does not suffice to advance a claim based on an infection and petitioner's vaccination acting concurrently.

vaccination. (Ex. 16, p. 6.) He explained that petitioner's initial symptoms of nausea and vomiting are consistent with the typical acute cerebellitis presentation. (*Id.*) Additionally, this diagnosis was further corroborated by

> objective abnormalities on neurological . . . examination including abnormal eye movements, ataxia, and dysmetria; repeat CSF analysis which continued to show an abnormal number and profile of white blood cells similar to the prior study obtained during her prior hospital admission . . . and indicative of an ongoing inflammatory condition within the central nervous system; . . . a repeat MRI . . . from which [there was] . . . a finding that the "cerebellar hemispheres may be overly prominent/full, consistent with the working diagnosis of post-vaccination cerebellitis" . . . [and petitioner's] symptomatic improvement after she received immune-modulating anti-inflammatory treatments including intravenous immunoglobin G (IVIg) and high dose corticosteroids.

(*Id.*) Dr. Goodman opined to a reasonable degree of medical certainty that petitioner suffered acute cerebellitis within an appropriate timeframe following the flu vaccination. (*Id.*)

Dr. Goodman asserted that Dr. Tompkins misinterpreted petitioner's treating neurologists' failure to detect known commercially available autoantibodies as a lack of evidence of the same. (Ex. 36, p. 1.) He explained that, in the clinical setting, it is not uncommon to encounter antibody-negative cases of presumed autoimmune encephalitis, of which cerebellitis is a subset. (*Id.* at 1-2.) Dr. Goodman cited Herematter et al. for the proposition that "antibody testing can never replace clinical judgment." (*Id.* at 2 (citing Christina Hermetter et al., *Systemic Review: Syndromes, Early Diagnosis, and Treatment in Autoimmune Encephalitis*, 9 FRONTIERS NEUROLOGY 1 (2018) (Ex. 37)).) He cited another study to support "autoantibodies as a mechanism of immune-mediated cerebellar ataxias (a generic term for cerebellar disease)." (*Id.* (citing Hiroshi Mitoma et al., *Fundamental Mechanisms of Autoantibody-Induced Impairments on Ion Channels and Synapses in Immune-Mediated Cerebellar Ataxias*, 21 INT'L J. MOLECULAR SCIS. 4936 (2020) (Ex. 38)).) Mitoma et al. noted that "different kinds of limbic encephalitis associated with autoantibodies against ion channels and synaptic receptors have been described" and that "[t]he same mechanism is discussed in immune-mediated cerebellar ataxias (IMCAs), but the pathogenesis has been less investigated." (*Id.* (quoting Mitoma et al., *supra*, at Ex. 38, p. 36).) Dr. Goodman stated,

> It is my opinion, (undetected) autoantibodies to cerebellar neuronal antigen(s) such as those described in the Mitoma review (be they directed at ion channels or synapses) could have been induced by immune response to the influenza vaccination. This remains a plausible potential mechanism underlying the cerebellitis diagnosed by the clinical judgment of the [Massachusetts General Hosphital] treating neurologists in this case.

(*Id.*) Finally, Dr. Goodman explained that the Institute of Medicine's ("IOM") conclusion that the evidence is inadequate to either accept or reject a causal relationship between the flu vaccine and encephalitis "should not be misconstrued as disproving the possibility of a rare occurrence of an influenza vaccine-induced cerebellitis (a form of encephalitis)." (*Id.*)

b. Respondent's Experts

i. Norman S. Werdiger, M.D., FAAN[8]

Dr. Werdiger submitted one report (Ex. A), and he also testified at the entitlement hearing, during which he was proffered without objection as an expert in neurology. (Tr. 195.) In pertinent part, Dr. Werdiger explained that acute cerebellitis is a neurological disorder characterized by the acute or subacute onset of cerebellar symptoms, including gait, appendicular, and truncal ataxia. (Ex. A, p. 9.) He noted that cognitive and behavioral changes have also been associated with various cerebellar disorders. (*Id.*) However, Dr. Werdiger pointed out that acute cerebellitis in adults is rare with a wide range of clinical presentations and outcomes, and the pathophysiology is not fully understood. (*Id.* at 9-10.)

Dr. Werdiger stressed that acute cerebellitis is characterized by abnormal MRI findings. (Ex. A, p. 10.) Such findings include "abnormalities on the T1 sequence (hypointensity/low signal or abnormal enhancement), T2/fluid-attenuated/inverse recovery (hyperintensity/high signal), diffusion-weighted imaging (hyperintensity/high signal) and apparent diffusion sequence (hyperintensity/high signal) sequences." (*Id.*) By way of exception, Dr. Werdiger noted one reported case of a patient with acute cerebellitis who had normal brain MRI imaging, but SPECT imaging showed a spotty lesion in the deep white matter of the right cerebellar hemisphere. (*Id.* (citing Park et al., *supra*, at Ex. 33).) Dr. Werdiger explained that "the significance of this finding has not yet been established." (*Id.* (citing Y. De Bruecker et al., *MRI Findings in Acute Cerebellitis*, 14 EUR. RADIOLOGY 1478 (2004) (Ex. A, Tab 4)).) He also opined that findings of "overly prominent/full cerebellar hemispheres" without other MRI abnormalities have not been associated with acute cerebellitis in the medical literature. (*Id.*)

[8] Dr. Werdiger received his medical degree from Cornell University Medical College (Medicine) in 1977 before going on to complete a residency in neurology in 1982. (Ex. B, p. 1; Tr. 189.) Following his residency, Dr. Werdiger transitioned to private practice of adult general neurology in 1982. (Ex. B, p. 1; Tr. 189-90.) At the same time, Dr. Werdiger received his board certification from the American Board of Psychiatry and Neurology and became a Clinical Instructor in Neurology at Yale University School of Medicine ("Yale"). (Ex. B, p. 1; Tr. 190.) In 1994, he became a Clinical Assistant Professor of Neurology at Yale, and by 2005, he was a Clinical Associate Professor of Neurology at Yale. (Ex. B, p. 1.) In 2003, Dr. Werdiger became the Assistant Chief of Neurology at Yale-New Haven Hospital, as well as a staff neurologist in the Yale Medicine Neurology Clinic in 2016. (*Id.*) He has been a neurological consultant in the Program since 2019. (*Id.* at 5-6.) He has authored peer-reviewed original research, educational materials, and invited editorials and commentaries. (*Id.* at 7; Tr. 193.)

Although the "causative agent underlying acute cerebellitis often remains unknown despite extensive serological testing," the condition has been reportedly associated with several pathogens and vaccines. (Ex. A, p. 10.) Most infectious acute cerebellitis cases are thought to be "parainfectious," *i.e.*, the result of an autoimmune disorder triggered by an infection or vaccine. (*Id.*) The IOM does not list acute cerebellitis as being associated with, or causally related to, influenza vaccination, and Dr. Werdiger asserts that there are no "strongly convincing published reports" of adult acute cerebellitis following flu vaccination. (*Id.* at 10-11.) Moreover, in a large literature review that included over 1,600 cases of post-vaccination neurological events in both children and adults, there are no specific cases of adult acute cerebellitis following Influenza A vaccination. (*Id.* at 11 (citing Graciela Cárdenas et al., *Neurological Events Related to Influenza A (H1N1) pdm09*, 8 INFLUENZA & OTHER RESPIRATORY VIRUSES 339 (2014) (Ex. 17)).)

Dr. Werdiger acknowledged that the medical literature provides a "feasible hypothesis for the immune-mediated pathological mechanism underlying vaccine induced immune responses." (Ex. A, p. 15.) "However, the existence of a feasible hypothesis is not the same as [a] showing of causation." (*Id.* (emphasis omitted).) In fact, the causative agent underlying acute cerebellitis often remains unknown, despite extensive serological testing. (*Id.*) That said, Dr. Werdiger noted that post-infectious cerebellitis has been associated with upper respiratory tract infections and gastroenteritis (*Id.* (citing Tracey A. Cho et al., *Case 30-2013: A 19-Year-Old Man with Otalgia, Slurred Speech, and Ataxia*, 369 NEW ENG. J. MED. 1253 (2013) (Ex. A, Tab 3)), and petitioner's medical records indicate that she had an upper respiratory tract infection and diarrhea just prior to the onset of her neurological symptoms (*Id.* (citing Ex. 13, p. 19)). Dr. Werdiger opined that either petitioner's upper respiratory infection or diarrhea "could have been viral infectious disorders" and associated with post-infectious acute cerebellitis. (*Id.*)

Dr. Werdiger noted that abnormalities may appear in the MRI study of a healthy patient and that none of the usual abnormalities for individuals with cerebellitis were present in petitioner's MRI study. (Ex. A, p. 14.) Thus, Dr. Werdiger opined that the findings on MRI cannot be used to either support or refute a diagnosis of acute cerebellitis in this case. (*Id.* (emphasis omitted).) Moreover, Dr. Werdiger opined that petitioner's improvement upon receipt of immune-mediated treatment "is not specific" and cannot be used to distinguish between a post-infectious and post-vaccinal immune-mediated syndrome. (*Id.* at 15.) While he agreed that the white blood cell count on CSF testing supports an ongoing inflammatory condition of the central nervous system, Dr. Werdiger opined that the studies to secure an associated infectious etiology were extensive but not exhaustive. (*Id.* at 14.) In other words, although the CSF findings are consistent with acute cerebellitis, they also cannot be used to either support or refute a specific diagnosis of post-vaccinal acute cerebellitis. (*Id.*) This is particularly true because the reported CSF formula is not specific for any one particular CNS inflammatory disorder, and it may be the case that no infectious agent or other cause can be found. (*Id.*)

Dr. Werdiger initially agreed that petitioner "likely had acute cerebellitis, based on her clinical presentation and examination" (Ex. A, p. 15), but he later introduced alternative diagnoses during the hearing. First, he clarified that, in his opinion, petitioner may reasonably be diagnosed as having a condition within the broader category of acute cerebral ataxia, but is less likely to have cerebellitis in particular. (Tr. 197-98.) This is significant because, while cerebellitis is a subset of acute cerebral ataxia, there is a broader spectrum of possible causes of acute cerebral ataxia generally. (*Id.* at 199-200, 207.) Cerebellitis is a form of acute cerebral ataxia for which an inflammatory cause is established. (*Id.* at 207.) Thus, objective evidence of swelling of the cerebellum is required for diagnosis. (*Id.* at 210-11.) Therefore, especially given Dr. Werdiger's interpretation of petitioner's MRI, he cannot agree that cerebellitis is implicated. (*Id.* at 197-98.) Second, Dr. Werdiger proposed that petitioner may have a condition called Wernicke's encephalopathy, which is a syndrome that similarly presents with a triad of symptoms – gait ataxia, eye movement abnormality, and alteration in mental status. However, it is less likely to be detected by MRI. (*Id.* at 198, 228-30.) Wernicke's encephalopathy generally results from vitamin deficiency, malnutrition, or alcohol abuse. (*Id.* at 228-29, 233-35.)

ii. S. Mark Tompkins, Ph.D.[9]

Dr. Tompkins submitted three reports in this case (Exs. C, E, F.) and also testified at the entitlement hearing, during which he was proffered without objection as an expert in immunology. (Tr. 311, 314.) Dr. Tompkins asserted that Dr. Goodman failed to provide a potential mechanism to explain how the components of the flu vaccine could elicit an immune response sufficient to cause petitioner's acute cerebellitis. (Ex. C, p. 3.) Instead, Dr. Tompkins suggested that Dr. Goodman's opinion is limited to a potential temporal association. (*Id.* at 4.)

[9] Dr. Tompkins received his Ph.D. in immunology from Emory University. (Ex. D, p. 1; Tr. 308.) Thereafter, Dr. Tomkins completed two postdoctoral fellowships – one in immunology and molecular pathogenesis at Northwestern University Medical School and another in virology/immunology at the Center for Biologics Evaluation and Research within the Food and Drug Administration. (Ex. D, pp. 1, 3; Tr. 308-09.) During his first postdoctoral fellowship, Dr. Tompkins "focused on immunologic mechanisms of induction of autoimmune disease, specifically interrogating antigen- and virus-induced models of experimental autoimmune encephalomyelitis; models for the neurologic autoimmune disease, multiple sclerosis." (Ex. C, p. 1.) His second fellowship "focused on understanding the immune response to influenza infection and vaccination." (*Id.*; Tr. 309.) He became as Assistant Professor in the Department of Infectious Diseases of the College of Veterinary Medicine at the University of Georgia in 2005. (Ex. D, p. 2; Tr. 309.) He was promoted to Associate Professor with Tenure in 2010 and then to Full Professor in 2016. (Ex. D, p. 2.) Also in 2016, Dr. Tompkins became a Full Professor and Full Member of the Center for Vaccines and Immunology in the College of Veterinary Medicine at the University of Georgia. (*Id.*) Throughout his time at the University of Georgia, Dr. Tompkins's research has focused "on understanding the interactions of influenza virus and influenza vaccines with the host." (Ex. C, p. 1.) "While aspects of [his] research entail zoonotic influenza viruses and understanding the determinants of infection, transmission, and pathogenesis, the core of [his] research remains understanding the immune response to viral infection and vaccination." (*Id.*) Dr. Tompkins has authored 110 peer-reviewed publications. (Tr. 307; Ex. D, pp. 30-42.)

Dr. Tompkins noted that Dr. Goodman provided several references discussing incidences of acute cerebellitis or other neurologic diseases following flu infection (Ex. C, p. 4.) and acknowledged there is a general acceptance that flu infection can cause neurologic disease. (*Id.* (citing Jeffrey J. Ekstrand, *Neurologic Complications of Influenza*, 19 SEMINARS PEDIATRIC NEUROLOGY 96 (2012) (Ex. C, Tab 1)).) For instance, the IOM has recognized an association, albeit rare, between flu infection and encephalitis. (*Id.* (citing INST. OF MED., ADVERSE EFFECTS OF VACCINES: EVIDENCE AND CAUSALITY (Kathleen Stratton eds., 2012) (Ex. C, Tab 2)).) However, Dr. Tompkins took issue with Dr. Goodman's suggestions that, because flu infection is associated with acute cerebellitis, it is also likely that flu vaccination is associated with acute cerebellitis. (Ex. C, p. 7.) He pointed out that, in making this assertion, Dr. Goodman relied on a single paper that suggested a case of acute cerebellitis in an elderly person was associated with a flu vaccination. (*Id.* at 4 (citing Park et al., *supra*, at Ex. 33).) However, Dr. Tompkins noted that Park et al. failed to provide a mechanism and relied solely on temporal association. (*Id.*) The authors acknowledged that acute cerebellitis in an elderly person had not yet been reported and that there has been only one reported case of acute cerebellitis following flu vaccination, but the patient was a child. (*Id.* (citing Park et al., *supra*, at Ex. 33).) Dr. Tompkins explained that these observations highlight the "rarity" of case reports suggesting an association between flu vaccination and acute cerebellitis. (*Id.*)

The literature review by Cárdenas et al. describes neurological events following flu vaccination; however, Dr. Tompkins explained that this literature review did not report any cases of acute cerebellitis or provide any potential causal associations for the reported neurological cases. (Ex. C, pp. 4-5 (citing Cárdenas et al., *supra*, at Ex. 17).) In contrast, Dr. Tompkins cited a report that monitored over three million doses of the 2012-2013 flu vaccine for specific adverse events, including seizures, Guillain-Barré syndrome, encephalitis, and anaphylaxis. (*Id.* at 5 (citing Alison Tse Kawai et al., *Absence of Associations Between Influenza Vaccines and Increased Risks of Seizures, Guillain-Barré Syndrome, Encephalitis, or Anaphylaxis in the 2012-2013 Season*, 23 PHARMACOEPIDEMIOLOGY & DRUG SAFETY 548 (2014) (Ex. C, Tab 3)).) The authors found "no increased risk following vaccination." (*Id.* (citing Kawai et al., *supra*, at Ex. C, Tab 3).) This finding is notable because, while petitioner received the 2015-2016 flu vaccine, both vaccines contain the influenza A (H1N1)pdm09 antigens that Dr. Goodman suggests may be associated with CNS injury. (*Id.* (citing Kawai et al., *supra*, at Ex. C, Tab 3; Fluarix Quadrivalent (Influenza Vaccine): Suspension for Intramuscular Injection 2015-2016 Formula [hereinafter Vaccine Package Insert] (Ex. C, Tab 4)).)

Dr. Tompkins explained that "influenza and other viral or bacterial infections are considered likely precursors" of acute cerebellitis and an onset of up to four weeks following infection, including concurrent infection, fit the chronology of petitioner's flu-like illness and acute cerebellitis. (Ex. C, p. 6; *see also* Ex. E, p. 4 (citing Sawaishi & Takada, *supra*, at Ex. 19; Şule Gökçe et al., *A Rare Cause of Childhood Cerebellitis-Influenza Infection: A Case Report and Systemic Review of Literature*, CASE REPORT PEDIATRICS, Feb. 20, 2017, at 1 (Ex. 22); De Bruecker et al., *supra*, at Ex. A, Tab 4; Hiroshi Mitoma et al., *Consensus Paper: Neuroimmune Mechanisms of Cerebellar*

Ataxias, 15 CEREBELLUM 213 (2016) (Ex. 30); Hiroshi Mitoma & Mario Manto, *The Physiological Basis of Therapies for Cerebellar Ataxias*, 9 THERAPEUTIC ADVANCES NEUROLOGICAL DISORDERS 396 (2016) (Ex. 31); Van Samkar et al., *supra*, at Ex. 34).) Dr. Tompkins opined that, although the precise infection was never diagnosed, the timing of petitioner's illness makes seasonal flu, or some other seasonal infection, likely. (*Id.*) Dr. Tompkins pointed to the national seasonal flu data that is collected through the U.S. Outpatient Influenza-like Illness Surveillance Network at FluView. (Centers for Disease Control & Prevention, *National, Regional, and State Level Outpatient Illness and Viral Surveillance*, FLUVIEW [hereinafter U.S. Flu Surveillance] (Ex. C, Tab 9).) He noted the timing of onset of petitioner's symptoms was within the peak of 2015-1026 flu season "with H1N1 influenza (orange) predominating." (Ex. C, p. 6 (citing U.S. Flu Surveillance, *supra*, at Ex. C, Tab 9).) Dr. Tompkins further noted that "several other respiratory and enteric viruses . . . have increased activity in March, presenting several potential infections" that have been suggested as preceding acute cerebellitis. (*Id.* (internal citation omitted); *see also* Yukio Sawaishi & Goro Takada, *Acute Cerebellitis*, 1 CEREBELLUM 223 (2002) (Ex. 19).) Moreover, Dr. Tompkins opined, although there is "almost no evidence" associating flu vaccination and acute cerebellitis, there is "extensive evidence" suggesting that viral infections can result in acute cerebellitis and/or other neurologic complications. (*Id.*) Thus, petitioner's viral infection, rather than vaccination, is "the most plausible explanation" for onset of her neurological symptoms. (*Id.*)

Dr. Goodman relied on a paper by Ichiyama et al., which found that "increased cytokine and NF-κB levels . . . detected in individuals with influenza virus-associated encephalopathy." (Ex. C, p. 5 (citing Takashi Ichiyama et al., *Analysis of Cytokien Levels of NF-κB Activation in Peripheral Blood Mononuclear Cells in Influenza Virus-Associated Encephalopathy*, 27 CYTOKINE 31 (2004) (Ex. 32)).) However, Dr. Tompkins noted that Dr. Goodman failed "to offer any data suggesting [flu] vaccination elicits increases in these cytokines in serum or CSF." (*Id.*) Dr. Tompkins explained that immune responses following flu vaccination have been assessed by measuring "the levels of serum antibody responses as hemagglutination-inhibiting antibodies" or, in the case of vaccine-specific cellular immune responses, by measuring "re-stimulation of [peripheral blood mononuclear cells] collected at various times following vaccination." (Ex. C, p. 5.) Although relevant to immunity, Dr. Tompkins stated that "these measures are not indicative of the inflammatory response during vaccination."[10] (*Id.*) Instead, Dr.

[10] He explained,

> [T]here are limited studies assessing immune responses in peripheral blood cells without stimulation or measuring cytokines and other mediators directly from serum and plasma. Mastalerz-Migas *et al.* measured cytokine concentration prior to, and one month after trivalent [flu] vaccination and found no differences in TNF-α, IL-10, IL-6 or IL-1β. Several groups have measured immune responses by analysis of messenger RNA (mRNA) transcripts as a surrogate of activation and protein expression. Changes in NF-κB are more difficult to compare. However its translocation to the nucleus results in production of a spectrum of cytokines, including TNF-α, Il-10, and IL-1β, allowing for a surrogate measure by assessing these cytokine responses or expression of these transcripts. A recent publication by Cole *et al.* (2017) measured a custom panel of 89 mRNA transcripts from whole blood (without further stimulation) from children prior to, and seven days after

Tompkins suggested that the vaccine that petitioner received "elicits an anti-inflammatory state and not the cytokine responses Dr. Goodman suggests are associated with cerebellitis." (*Id.* at 6.) In other words, "[w]hile these cytokines are present during influenza and other pathogen infections, studies of influenza vaccination show these pro-inflammatory cytokines are not elicited by the exact vaccine that [petitioner] received."[11] (*Id.* at 7.)

Dr. Tompkins further opined that the presence or absence of autoantibodies is not indicative of those antibodies causing disease. (Ex. E, p. 2.) Dr. Tompkins cited a review by Hermetter et al., in which it was found that "[a]ntibody detection is unlikely to be an early diagnostic criterion because results take several days at least and are not available at disease onset" and that the test results "can also be negative in up to 50% of autoimmune encephalitis series." (*Id.* (emphasis omitted) (quoting Hermetter et al., *supra*, at Ex. 37).) In acknowledging "the variability of detection of autoantibodies in autoimmune disease," the IOM notes that "the presence of autoantibodies does not correlate perfectly with disease" as autoantibodies have been detected in both healthy individuals and patients with autoimmune disease. (*Id.* (citing INST. OF MED., *supra*, at Ex. C, Tab 2).) The IOM further notes that the "presence of tissue-specific antibody response does not prove it as a mechanism of disease." (*Id.*) Thus, even accepting Dr. Goodman's proposition that undetected antibodies could have been induced by the flu vaccine, "detection of autoimmune antibodies would still not satisfy the [IOM's] criteria for evidence for a mechanism of action."[12] (*Id.*) On top of that, Dr. Goodman failed to

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> [flu] vaccination. The panel included IL-10, IL-1β, IL-6 and interferons, however the authors found that there were no genes that were up-regulated and only seven genes downregulated in [flu vaccine] recipients. Notably, the [flu vaccine] recipients received the 2015-2016 quadrivalent vaccine from Sanofi and GSK, so a proportion of individuals in this study received the identical vaccine received by [petitioner], and individuals receiving the Sanofi Fluzone vaccine, received a near identical split-inactivated vaccine. Importantly, the authors note, "These data suggest an anti-inflammatory state 7 days post-[flu] vaccination."

(*Id.* at 5-6 (internal citations omitted) (citing A. Mastalerz-Migas et al., *Cytokines and Toll-Like Receptor in the Immune Response to Influenza Vaccination*, 5 ADVANCES EXPERIMENTAL MED. & BIOLOGY: NEUROSCIS. & RESPIRATION 35 (2015) (Ex. C, Tab 6); Heike L. Pahl, *Activators and Target Genes of Rel/NF-κB Transcription Factors*, 18 ONCOGENE 6853 (1999) (Ex. C, Tab 7); Kelly Stefano Cole et al., *Differential Gene Expression Elicited by Children in Response to the 2015-16 Live Attenuated Versus Inactivated Influenza Vaccine*, 35 VACCINE 6893 (2017) (Ex. C, Tab 8)).)

[11] One study by Stoel et al. "assessed cytokine responses from human dendritic cells stimulated with split-inactivated monovalent (H3N2) influenza vaccine." (*Id.* (citing Maaike Stoel et al*., Innate Responses Induced by Whole Inactivated Virus and Subunit Influenza Vaccines in Cultured Dendritic Cells Correlate with Immune Response* In Vivo, PLOS ONE, May 1, 2015, at 1 (Ex. C, Tab 5)).) Dr. Tompkins explained that dendritic cells "are the first immune cells to capture and respond to influenza vaccine antigens and are central to priming adaptive immune responses." (*Id*.) According Dr. Tompkins, the findings by Stoel et al. suggest that "the earliest immune responses" to flu vaccination "are not pro-inflammatory." (*Id.*)

[12] Dr. Tompkins acknowledged that Dr. Goodman correctly noted that the IOM's statement regarding there being inadequate evidence to reject an association between the flu vaccine and encephalitis does not preclude a possible association. (Ex. E, p. 3.) However, he stressed that study he cited by Kawai, et al., post-dated the IOM's 2012 report. (*Id*.)

provide a link between flu vaccination and the undetected autoantibodies. (*Id.*) Dr. Tompkins opined that there is no evidence of flu vaccination eliciting antibody responses against cerebellar ion channels or synaptic receptors. (Ex. E, p. 2.) Dr. Tompkins explained that when the flu infection is associated with encephalitis, the virus is considered to contribute to symptoms. (*Id.* at 2-3.) "In the absence of live virus infection, there is not a mechanism to explain triggering of acute cerebellitis following influenza vaccination." (*Id.* at 3.)

V. Discussion

a. Diagnosis

The parties paid a great deal of attention to petitioner's correct diagnosis. This reflects the fact that petitioner's treating physicians likewise struggled to arrive at a diagnosis for petitioner's condition. Ordinarily, where the identity and nature of the vaccine-related injury is in dispute, the Federal Circuit has concluded that it is "appropriate for the special master to first determine what injury, if any, [is] supported by the evidence presented in the record before applying the *Althen* test to determine causation." *Lombardi v. Sec'y of Health & Human Servs.*, 656 F.3d 1343, 1352-53 (Fed. Cir. 2011). In this case, however, even assuming *arguendo* that petitioner suffered an acute cerebellitis as alleged, petitioner cannot preponderantly demonstrate that her condition was vaccine-caused for the reasons discussed below. Accordingly, it is not necessary to definitively resolve petitioner's diagnosis. Ultimately, "the function of a special master is not to 'diagnose' vaccine-related injuries." *Andreu v. Sec'y of Health & Human Servs.*, 569 F.3d 1367, 1382 (Fed. Cir. 2009). Instead, the special master must determine, "based on the record evidence as a whole and the totality of the case, whether it has been shown by a preponderance of the evidence that a vaccine caused the [petitioner's] injury." *Id.* (quoting *Knudsen v. Sec'y of Health & Human Servs.*, 35 F.3d 543, 549 (Fed. Cir. 1994)). Thus, for purposes of this decision I assume, but do not decide, that petitioner suffered acute cerebellitis.

b. *Althen* prong one

Under *Althen* prong one, petitioners must provide a "reputable medical theory," demonstrating that the vaccine received can cause the type of injury alleged. *Pafford v. Sec'y of Health & Human Servs.*, 451 F.3d 1352, 1355-56 (Fed. Cir. 2006) (quoting *Pafford v. Sec'y of Health & Human Servs.*, No. 01-0165V, 2004 WL 1717359, at *4 (Fed. Cl. Spec. Mstr. July 16, 2004)). Such a theory must only be "legally probable, not medically or scientifically certain." *Knudsen*, 35 F.3d at 548-49. Petitioners may satisfy the first *Althen* prong without resort to medical literature, epidemiological studies, demonstration of a specific mechanism, or a generally accepted medical theory. *See Andreu*, 569 F.3d at 1378 (citing *Capizzano v. Sec'y of Health & Human Servs.*, 440 F.3d 1317, 1325-26 (Fed. Cir. 2006)). However, "[a] petitioner must provide a 'reputable medical or scientific explanation' for [their] theory." *Boatmon*, 941 F.3d at 1359 (quoting *Moberly v. Sec'y of Health & Human Servs.*, 592 F.3d 1315, 1322 (Fed.

Cir. 2010)). "While it does not require medical or scientific certainty, it must still be 'sound and reliable.'" *Id.* (quoting *Knudsen*, 35 F.3d at 548-49).

Dr. Goodman theorized that the flu vaccine can cause cerebellitis in part based on the fact that antibodies against sodium ion channels have been observed in cerebral ataxias and other autoimmune encephalitides. (Tr. 107-08; S. Jarius & B. Wildemann, *'Medusa Head Ataxia': The Expanding Spectrum of Purkinje Cell Antibodies in Autoimmune Cerebellar Ataxia. Part 2: Anti-PKC-gamma, Anti-GluR-delta2, Anti-Ca/ARHGAP26 and Anti-VGCC*, 12 J. NEUROINFLAMMATION 167 (2015) (Ex. 25); Mitoma et al., *supra*, at Ex. 38.) However, he acknowledged that he is unable to identify any specific antibody as being implicated by his theory and is not aware of any literature reporting sodium ion channel antibodies in response to vaccination. (Tr. 107-08, 178.) Moreover, he acknowledged on cross examination that the presence of autoantibodies does not necessarily correlate with disease.[13] (*Id.* at 149-50 (discussing INST. OF MED., *supra*, at Ex. C, Tab 2, p. 90). *But see id.* at 109, 182-83 (disagreeing as to the significance of this fact).) Ultimately, Dr. Goodman characterized this as only a "plausible" hypothesis. (*Id.* at 107-08.) He agreed that it is still an open research question as to whether or how antibodies would cause such a clinical syndrome. (*Id.* at 180.)

Dr. Werdiger likewise opined that the theories available to potentially implicate the flu vaccine as a cause of cerebellitis do not rise beyond the level of mere plausibility or feasibility. (Tr. 238, 261-64.) He stressed that the flu vaccine is not a known risk factor for acute cerebral ataxias, of which cerebellitis is a subset. (*Id.* at 207.) He further explained that the cause of cerebellitis, apart from being inflammatory in nature, is often unknown and that knowledge about the condition is "deficient" or "incomplete." (*Id.* at 208-09.) He suggested that cerebellitis, and the entire category of acute cerebral ataxias, may be better considered syndromes, rather than diseases *per se*. (*Id.* at 255-56.) However, although cerebellitis is rare, it is prevalent enough that the medical literature has been able to implicate infections and other vaccines as potential causes. (*Id.* at 263-65.) According to Dr. Werdiger, this should be viewed as telling vis-à-vis any effort to implicate the flu vaccine as a cause. (*Id*.)

Both experts agree that infection is a primary cause of cerebellitis, though Dr. Goodman cautions infection is a more important cause of cerebellitis in childhood. (Ex. 16, p. 3; Tr. 154, 208.) Accordingly, a significant portion of the medical literature filed by petitioner relates to the ability of influenza infection to cause neurologic complications, including acute cerebellitis. (*See* Carol A. Glaser et al., *A Population-Based Study of Neurologic Manifestations of Severe Influenza A(H1N1)pdm09 in California*, 55 CLINICAL INFECTIOUS DISEASE 514 (2012) (Ex. 20); Subhashini A. Sellers et al., *The Hidden Burden of Influenza: A Review of the Extra-Pulmonary Complications of Influenza Infection*, 11 INFLUENZA & OTHER RESPIRATORY VIRUSES 372 (2017) (Ex. 21); Gökçe et al., *supra*, at Ex. 22; Maroun M. Sfeir & Catherine E. Najem, *Cerebellitis Associated with*

[13] Additionally, Dr. Goodman acknowledged that petitioner tested negative for the ion channel autoantibodies discussed by Mitoma, et al. (Ex. 38). (Tr. 169-70.)

Influenza A(H1N1)pdm09, United States, 2013, 20 EMERGING INFECTIOUS DISEASES 1578 (2014) (Ex. 23); Hideo Okuno et al., *Characteristics and Outcomes of Influenza-Associated Encephalopathy Cases Among Children and Adults in Japan, 2010-2015*, 66 CLINICAL INFECTIOUS DISEASES 1831 (2018) (Ex. 24); Abir Mukherjee et al., *Central Nervous System Pathology in Fatal Swine-Origin Influenza A H1N1 Virus Infection in Patients with and Without Neurological Symptoms: An Autopsy Study of 15 Cases*, 122 ACTA NEUROPATHOLOGICA 371 (2011) (Ex. 26); R. O'Sullivan et al., *Acute Cerebellitis: Associated with Dual Influenza A (H1N1) and B Infection*, 106 IRISH MED. J. 87 (2013) (Ex. 28); Ichiyama et al., *supra*, at Ex. 32.) However, while this potentially provides *some* evidence supportive of a theory of vaccine causation, it is not sufficient without more. For example, the Institute of Medicine ("IOM")[14] "considers the effects of natural infection one type of mechanistic evidence" for evaluation, but nonetheless assesses that form of evidence as "weak" and insufficient to support the flu vaccine as a cause of encephalitis.[15] (INST. OF MED., *supra*, Ex. C, Tab 2, p. 328.) The IOM explains that, in

[14] The Institute of Medicine (known as the National Academy of Medicine since 2015) is the medical arm of the National Academy of Sciences. The National Academy of Sciences ("NAS") was created by Congress in 1863 to be an advisor to the federal government on scientific and technical matters (*see* An Act to Incorporate the National Academy of Sciences, ch. 111, 12 Stat. 806 (1863)), and the Institute of Medicine is an offshoot of the NAS, established in 1970 to provide advice concerning medical issues. When Congress enacted the Vaccine Act in 1986, it directed that the IOM conduct studies concerning potential causal relationships between vaccines and illnesses. *See* § 300aa-1 note. In this case, respondent has filed a complete copy of the IOM's 2012 report: Adverse Effects of Vaccines: Evidence and Causality. (INST. OF MED., *supra*, at Ex. C, Tab 2.)

[15] Notably, the IOM employs a standard for finding causation that is higher than what is required by petitioner's burden of proof. *E.g.*, *Raymo v. Sec'y of Health & Human Servs.*, No. 11-0654V, 2014 WL 1092274, at *21 n.39 (Fed. Cl. Spec. Mstr. Feb. 24, 2014). Accordingly, IOM reports and findings are typically approached with caution and generally not treated as dispositive. *Porter v. Sec'y of Health & Human Servs.*, 663 F.3d 1242, 1252 (Fed. Cir. 2011) (noting the special master's comment that "IOM reports are favored, although not dispositive, in the Vaccine Act Program," then affirming special master's decision). Nonetheless, numerous prior cases have demonstrated that special masters may account for IOM findings in reaching their decisions. *See, e.g.*, *Crutchfield v. Sec'y of Health & Human Servs.*, 125 Fed. Cl. 251, 262 (2014) (noting that "it was appropriate for the special master to consider the medical literature presented, including the IOM report" and that "the court often has relied on the findings of the Institute of Medicine"); *see also Isaac v. Sec'y of Health & Human Servs.,* 108 Fed. Cl. 743, 755 (2013) (affirming the special master's reliance on findings of the IOM), *aff'd per curiam*, 540 F. App'x 999 (Fed. Cir. 2013); *Porter*, 663 F.3d at 1252 (noting the special master's comment that "IOM reports are favored, although not dispositive, in the Vaccine Act Program," then affirming the special master's decision); *Cedillo v. Sec'y of Health & Human Servs.*, No. 98-916V, 2009 WL 331968, at *94 (Fed. Cl. Spec. Mstr. Feb. 12, 2009), *mot. for rev. denied*, 89 Fed. Cl. 158 (2009), *aff'd*, 617 F.3d 1328 (Fed. Cir. 2010) (affirming the special master's reliance on the IOM's conclusions); *Rodriguez v. Sec'y of Health & Human Servs.*, 67 Fed. Cl. 409, 410 (2005) (relying on IOM report regarding vaccine causation of an injury); *Althen v. Sec'y of Health & Human Servs.*, No. 00-170V, 2003 WL 21439669, at *11 n.28 (Fed. Cl. Spec. Mstr. June 3, 2003) ("Due to the IOM's statutory charge, the scope of its review, and the cross-section of experts making up the committee reviewing the adverse events associated with vaccines, the court considers their determinations authoritative and subject to great deference."), *rev'd on other grounds*, 58 Fed. Cl. 270 (2003) (citing IOM reports frequently in support of various scientific propositions), *aff'd*, 418 F.3d 1274 (Fed. Cir. 2005); *Terran v. Sec'y of Health & Human Servs.*, 41 Fed. Cl. 330, 337 (1998) (affirming special master's reliance on conclusions of IOM), *aff'd*, 195 F.3d 1302 (Fed. Cir. 1999), *cert. denied*, 531 U.S. 812 (2000); *Cucuras v. Sec'y of Health & Human Servs.*, 993 F.2d 1525, 1529 (Fed. Cir. 1993) (noting that the special master had placed "a great deal of weight" on an IOM report in reaching a decision, then affirming the special master's decision); *Stroud v. Sec'y of Health & Human Servs.*, 113

its view, "[e]vidence consisting only of parallels with the natural infection is never sufficient to merit a conclusion other than the evidence is inadequate to accept or reject a causal relationship." (*Id.* at 42, n. 6.) Dr. Tompkins further stressed that the flu vaccine is an inactivated vaccine, meaning that it cannot infect cells or replicate. (Tr. 317-18.) Thus, the immune response to the flu vaccination is meaningfully different than the immune response to infection. (*Id*.)

Dr. Goodman cited a study by Cárdenas et al. that conducted a literature review to examine neurologic events related to influenza A (H1N1) – both from infection and post-vaccination. (Ex. 17.) They reviewed 104 articles reporting on 1,636 patients. Of those patients, 287 were post-vaccine patients and the remaining 1,349 were infection patients. (*Id*. at 1.) In describing the clinical characteristics of the post-vaccine group, the authors noted that the most common neurologic complication (125 cases) was polyneuropathy, including GBS. (*Id*. at 2.) They reported 41 cases of encephalopathy or encephalitis. (*Id*.) In comparison to the infection group, clinical outcomes in the post-vaccine group were less severe and, whereas GBS predominated among the post-vaccine group, encephalopathy-encephalitis predominated in the infection group. (*Id*. at 3.) Although the authors discuss hypotheses of vaccine-caused neurologic events, the authors note that post-vaccine neurologic complications are less commonly reported as compared to infection and the paper includes no statistical analysis of post-vaccination risk for neurologic complications. (*Id*. at 4-5.) The authors acknowledge that their analyses "show clear limitations due to the incomplete information in most of the case reports retrieved from medical literature, and also their descriptive nature." (*Id*. at 5.) On the whole, this paper tends to show that the effects of infection cannot be equated with the effects of vaccination.

Nonetheless, citing Ichiyama et al., Dr. Goodman stressed a pathologic role for proinflammatory cytokines, noting that they have been found in the cerebral spinal fluid of patients suffering influenza-associated cerebellitis. (Tr. 120-21; Ex. 16, pp. 4-5; Ichiyama et al., *supra*, at Ex. 32.) In particular, he stressed that these patients have increased levels of serum IL-6, sTNFR1, IL-10, CSF IL-6, and NF-κB. (Ex. 16, p. 5.) He simply posited that the same response is generated by vaccination. (Tr. 107, 173.) However, even where there is some reason to suspect a condition may be cytokine mediated, this does not automatically lead to the conclusion that vaccines can cause the injury merely because vaccines produce some cytokine elevations. *See, e.g.*, *Dean ex rel. I.D. v. Sec'y of Health & Human Servs.*, No. 13-808V, 2017 WL 2926605, at *17-18 (Fed. Cl. Spec. Mstr. June 9, 2017) (explaining in the context of alleged encephalopathy that, even though "[m]any of the general principles (as evidenced by Petitioner's expert reports plus the filed medical or scientific literature) that underlie this theory are not disputed," "[t]he most immediately apparent weakness in this case's causation theory is the heavy lifting it assigns to the post-vaccination cytokine production process as the cause of almost all of the pathologic effects of the vaccines at issue"); *Bohn ex rel. G.B. v. Sec'y of Health & Human Servs.*, No. 16-0265V, 2021 WL

F.3d 1258 (Fed. Cir. 1997) (unpublished) (concluding that the special master did not err in relying upon an IOM report that neither party filed as evidence); *Ultimo v. Sec'y of Health & Human Servs.*, 28 Fed. Cl. 148, 152 (1993) (finding it proper for a special master to rely on IOM report).

4302367, at *16-21 (Fed. Cl. Spec. Mstr. Aug. 23, 2021) (explaining that petitioner's experts sought "to marry via *ipse dixit* literature showing elevated proinflammatory post-vaccination cytokines on the one hand with literature showing SCLS and cytokine storm as being injurious cytokine-mediated conditions on the other," but that "the literature filed in this case demonstrates only that cytokine levels observed post-vaccination are dramatically lower than the levels of cytokines measured in those experiencing injurious systemic cytokine reactions"); *Chavez v. Sec'y of Health & Human Servs*., No. 16-1479V, 2022 WL 3368502, at *24 (Fed. Cl. Spec. Mstr. July 19, 2022) (explaining that "[m]edical literature filed by petitioner supports the proposition that proinflammatory cytokines may play a role in the development of fever, which may lead to seizures and epilepsy" but that "[t]he literature does not support the notion that afebrile seizures are triggered by vaccination"). Dr. Tompkins contrasted the literature cited by Dr. Goodman against another paper by Sibinski et al. (Ex. J.). Comparing this literature shows that the flu vaccine does not generate a cytokine response comparable to what Ichiyama et al. identified as potentially causal of cerebellitis. (Tr. 328-31.) Dr. Tompkins explained that the immune response to the flu vaccine is weaker than the immune responses documented as leading to cerebellitis, and vaccine-produced cytokines are not an established cause of cerebellitis. (Tr. 328-31, 336.) This would tend to underscore the conclusion that the Cárdenas et al. paper primarily supports the notion that adverse effects from vaccination cannot be equated to adverse effects of infection. Dr. Goodman had no effective response to this line of reasoning from Dr. Tompkins. (Tr. 174-77.)

Apart from Cárdenas et al., the only other evidence of record purporting to directly implicate the flu vaccine as a cause of relevant neurologic injury are two case reports filed by petitioner. Exhibit 18 is a case report of a patient who suffered acute disseminated encephalomyelitis ("ADEM") following receipt of an influenza A (H1N1) vaccination. (Sang Teak Lee et al., *An Adverse Event Following 2009 H1N1 Influenza Vaccination: A Case of Acute Disseminated Encephalomyelitis*, 54 KOREAN J. PEDIATRICS 422 (2011) (Ex. 18).) However, this is not persuasive with respect to the injury at issue in this case. ADEM is a demyelinating condition and, as the authors of this case report explain, the influenza vaccine has separately been implicated as a cause of demyelinating conditions, such as GBS. (*Id.* at 3.) Accordingly, the fact that the flu vaccine was implicated in a case of ADEM is not strong evidence vis-à-vis the cerebellitis at issue in this case. For example, a review of prior reports of acute cerebellitis cited by Dr. Goodman explains pathologic investigation has suggested that "direct invasion of an etiology agent" is likely the primary pathogenic mechanism of acute cerebellitis, as distinct from the broader category of acute cerebellar ataxia, which may be post-infectious. (Sawaishi & Takada, *supra*, at Ex. 19, p 5.) Dr. Goodman sought to downplay the significance of this distinction, though he otherwise noted that acute cerebral ataxia can have other causes that are not inflammatory. (Tr. 158-59.) But, in any event, the authors characterize the idea that acute cerebellitis has a post-infectious immune pathogenesis similar to ADEM as speculation. (Sawaishi & Takada, *supra*, at Ex. 19, p. 5.)

Petitioner did also file a single case report of a 66-year-old man who developed acute cerebellitis three weeks after receiving a flu vaccination; however, the authors acknowledged that any causal assessment was limited to noting the presence of an apparent temporal association. (Park et al., *supra*, at Ex. 33, p. 3 (explaining that "[w]e were not able to determine the definitive etiology of our case, close temporal relation between influenza vaccination and evolution of symptoms suggests that influenza vaccination may cause [acute cerebellitis] in an elderly patient").) This is not strong evidence. Petitioners in this Program often highlight the usefulness of case reports in cases of rare diseases or unusual occurrences. *E.g.*, *Patton v. Sec'y of Health & Human Servs.*, 157 Fed. Cl. 159, 166-68 (2021). However, case reports "do not purport to establish causation definitively, and this deficiency does indeed reduce their evidentiary value," even though they are not entirely devoid of evidentiary value. *Paluck ex rel. Paluck v. Sec'y of Health & Human Servs.*, 104 Fed. Cl. 457, 475 (2012) (quoting *Campbell v. Sec'y of Health & Human Servs.*, 97 Fed. Cl. 650, 668 (2011)); *see also Crutchfield v. Sec'y of Health & Human Servs.*, No. 09-0039V, 2014 WL 1665227, at *19 (Fed. Cl. Spec. Mstr. Apr. 7, 2014) ("[S]ingle case reports of Disease X occurring after Factor Y . . . do not offer strong evidence that the *temporal* relationship is a *causal* one—the temporal relationship could be pure random chance."), ***aff'd***, 125 Fed. Cl. 251 (2014).

In light of all of the above, and considering the record as a whole, I cannot conclude that there is preponderant evidence supporting a sound and reliable theory of causation that would implicate the flu vaccine as a cause of cerebellitis. Although there is not a complete absence of evidence from which a suspicion of causation could be drawn, this is insufficient to meet petitioner's burden of proof under *Althen* prong one. *Boatmon*, 941 F.3d at 1360 (noting that the Federal Circuit has repeatedly rejected the idea that merely "possible" theories of causation are sufficient).

c. *Althen* prongs two and three

Even had petitioner demonstrated that the flu vaccine *can* cause cerebellitis, she must also establish that it *did* cause the condition in this specific case. *Pafford*, 451 F.3d at 1356. This aspect of petitioners' *prima facie* showing is generally broken down into two further questions pursuant to *Althen* prongs two and three. The second *Althen* prong requires proof of a logical sequence of cause and effect usually supported by facts derived from a vaccinee's medical records. *Althen*, 418 F.3d at 1278; *Andreu*, 569 F.3d at 1375-77; *Capizzano*, 440 F.3d at 1326; *Grant*, 956 F.2d at 1148. The third *Althen* prong requires establishing a "proximate temporal relationship" between the vaccination and the injury alleged. *Althen*, 418 F.3d at 1278. A petitioner must offer "preponderant proof that the onset of symptoms occurred within a timeframe for which, given the medical understanding of the disorder's etiology, it is medically acceptable to infer causation." *de Bazan v. Sec'y of Health & Human Servs.*, 539 F.3d 1347, 1352 (Fed. Cir. 2008).

Medical records are generally viewed as particularly trustworthy evidence. *Cucuras*, 993 F.2d at 1528. However, medical records and/or statements of a treating

physician's views do not *per se* bind the special master. *See* § 300aa-13(b)(1) (providing that "[a]ny such diagnosis, conclusion, judgment, test result, report, or summary shall not be binding on the special master or court"); *Snyder v. Sec'y of Health & Human Servs.*, 88 Fed. Cl. 706, 745 n.67 (2009) ("[T]here is nothing . . . that mandates that the testimony of a treating physician is sacrosanct—that it must be accepted in its entirety and cannot be rebutted."). A petitioner may support a cause-in-fact claim through either medical records or expert medical opinion. § 300aa-13(a). The special master is required to consider all the relevant evidence of record, draw plausible inferences, and articulate a rational basis for the decision. *Winkler*, 88 F.4th at 963 (citing *Hines*, 940 F.2d at 1528).

During the hearing, Dr. Goodman characterized his causal opinion as resting on the following points: The Massachusetts General Hospital assessment, including the diagnosis, neurologic findings, and ruling-out of other etiologies; clinical manifestations; persistent lymphocytic pleocytosis in the cerebral spinal fluid confirming an inflammatory condition of the central nervous system; response to IVIg treatment; and the clinical course of events, including a post-vaccination onset. (Tr. 95-96, 102-04, 112-15, 118, 121-22, 148, 161.) Importantly, however, accepting *arguendo* that petitioner suffered cerebellitis, most of these factors speak merely to the fact of a disease process consistent with cerebellitis and do not readily distinguish a post-vaccinal etiology for that cerebellitis. This is a critical point given that there is no dispute that petitioner was suffering symptoms of infection prior to onset of her neurologic condition. Dr. Goodman relied in part on the notion that Massachusetts General Hospital had taken adequate measures to rule out a viral etiology. (*Id.* at 114-15, 117.) However, there are several issues with this. On the whole, Dr. Goodman overstates the degree to which the Massachusetts General Hospital assessment supports his own conclusion.

First, the records do not actually indicate a diagnosis of a post-vaccination injury. Instead, under diagnoses, petitioner is listed as having a principal problem of "cerebellar disease." (Ex. 3, p. 25.) The accompanying summary of the hospital course indicates that "[p]resentation [is] confusing, but possible post-vaccination or post-viral syndrome such as cerebellitis, with question of functional overlay." (*Id*.) Moreover, to the extent there was discussion of attributing petitioner's condition to vaccination, it was only tentative. The records repeatedly refer to a "post-vaccination cerebellitis" as a "working diagnosis." (*Id.* at 25, 111, 120, 127, 129.) Additional notations further suggest that a post-vaccinal etiology was merely being questioned. (*Id*. at 28 ("? Post vaccination given recent flu shot").)

Second, the hospital team singled out two factors as potentially supportive of a post-vaccinal process; however, Dr. Goodman does not actually agree that these two factors are helpful in distinguishing a viral from a post-vaccinal process in this case. The record indicates that a post-vaccination process was questioned "given recent flu shot, cells in CSF." (Ex. 3, p. 28.) Yet, Dr. Goodman testified that the finding of lymphocytic pleocytosis cannot in itself distinguish whether the detected inflammation was due to a vaccine reaction or a viral infection and that the temporal relationship

between petitioner's preceding illness and cerebellitis likewise supported a possible causal relationship. (Tr. 112-13, 174, 183-84.)

Third, to the extent the hospital team also noted that an "extensive" workup for infectious causes was negative, the significance of this factor is clouded by the fact that the hospital's assessment did not appear to have the benefit of knowing petitioner had been suffering symptoms of an upper respiratory infection. The assessment discusses only the possible presence of a gastrointestinal illness based on petitioner's vomiting (Ex. 3, p. 25); however, Dr. Goodman testified that petitioner's report of bronchitis also implicates an infection (Tr. 120). In that regard, Dr. Werdiger calls into question the completeness of the hospital team's investigation, noting that petitioner was not tested for the Epstein-Barr virus, which is a virus associated with cerebellitis. (*Id.* at 230-31.) But, in any event, Dr. Goodman agreed that the absence of a documented infectious agent does not actually preclude a post-infectious process. (*Id.* at 119.)

And, finally, to the extent the hospital team's conclusion was otherwise based primarily on a temporal relationship to vaccination, this is not sufficient without more. The Federal Circuit has explained that, "[a]lthough probative, neither a mere showing of a proximate temporal relationship between vaccination and injury, nor a simplistic elimination of other potential causes of the injury suffices, without more, to meet the burden of showing actual causation." *Althen*, 418 F.3d at 1278 (citing *Grant*, 956 F.2d at 1149).

Ultimately, Dr. Goodman agreed that a viral infection was implicated by petitioner's report of bronchitis, that her preceding symptoms were potentially consistent with an infection, that infection remained an important part of the differential diagnosis, and that infection was a feasible cause of petitioner's own cerebellitis. (Tr. 120, 162-65, 174, 183.) Although Dr. Goodman opined that a post-vaccinal process was more likely, he acknowledged that it is impossible to distinguish a post-vaccinal process from a post-infectious process in this case with certainty. (*Id.* at 116-17.) And, as previously noted (*see* note 7, *supra*), Dr. Goodman did not present any theory that would support a synergistic relationship between vaccination and infection. Dr. Werdiger also stressed that the Massachusetts General Hospital team equivocated between a post-vaccinal or post-infectious etiology. (Tr. 226.) He opined that clinically "there's really no good way to tell the two apart." (*Id*.) Thus, he opined that, given the stronger relationship between infection and cerebellitis as a matter of general causation, and given that petitioner actually did have symptoms of a viral illness prior to onset, a post-infectious process must be considered more likely than a post-vaccinal process. (*Id.* at 226-28.) I agree. *Accord Winkler*, 88 F.4th at 963 (finding no error where the special master considered an infectious cause under analysis of petitioner's initial burden of proof under *Althen*).

Additionally, remaining uncertainty with regard to the actual onset of petitioner's alleged cerebellitis creates a further "catch-22" with respect to petitioner's showing under *Althen* prongs two and three. Petitioner received the flu vaccine at her PCP's office on March 21, 2016. (Ex. 2, p. 23.) Two days later, on March 23, 2016, she

presented to the emergency department complaining, *inter alia*, of a 12-hour history of nausea and vomiting that began the morning after she received the flu vaccine, *i.e.*, within 24 hours of vaccination. (Ex. 13, p. 18.) At that encounter, her neurologic exam was normal, and she was diagnosed with a viral syndrome. (*Id*. at 23-24.) This viral syndrome is the basis for that aspect of the Massachusetts General Hospital team's differential diagnosis that posited a post-infectious cerebellitis. (Ex. 3, p. 25 (noting that "she had [prominent] nausea and vomiting, so the possibility of a viral infection, such as rotavirus, and subsequent post-viral cerebellitis is reasonable").) During the hearing, however, Dr. Goodman explained that it is ambiguous whether petitioner's symptoms of nausea and vomiting were symptoms of an infection or manifestations of her cerebellitis. (Tr. 162-64.) He explained that these symptoms would be consistent with either. (*Id*.) Yet, Dr. Goodman was also clear in explaining that he would only support vaccine causation if onset of petitioner's neurologic condition occurred at least two days post-vaccination. (*Id.* at 99-100, 106.)

Accordingly, if petitioner's nausea and vomiting are attributable to her cerebellitis, rather than a viral infection, then this would undercut the post-infectious aspect of the Massachusetts General Hospital differential diagnosis, potentially contributing to petitioner's showing under *Althen* prong two. However, in that context, Dr. Goodman would not support a casual relationship between petitioner's cerebellitis and her vaccination based on the timing of onset, meaning that her claim could not succeed under *Althen* prong three.

Conversely, if nausea and vomiting are instead attributed to a viral infection, as they were initially diagnosed (Ex. 13, p. 18), rather than to any neurologic condition, then this would help petitioner meet her burden under *Althen* prong three given limitations of Dr. Goodman's opinion. However, this would then underscore the post-infectious aspect of the differential diagnosis recorded by the team at Massachusetts General Hospital, which, separate and apart from the above-discussed bronchitis, was premised on their knowledge of petitioner's prior suspected gastrointestinal illness (Ex. 3, p. 25).

In any event, even if petitioner did satisfy *Althen* prong three by suggesting her earliest symptoms of nausea and vomiting were not neurologic, satisfaction of *Althen* prong three alone would not permit her to prevail. *Veryzer v. Sec'y of Health & Human Servs.*, 100 Fed. Cl. 344, 356 (2011) (explaining that a "temporal relationship alone will not demonstrate the requisite causal link and that petitioner must posit a medical theory causally connecting the vaccine and injury"), *aff'd per curiam*, 475 F. App'x 765 (Fed. Cir. 2012); *Hibbard v. Sec'y of Health & Human Servs.*, 698 F.3d 1355, 1364-65 (Fed. Cir. 2012) (holding the special master did not err in resolving the case pursuant to *Althen* prong two when respondent conceded that petitioner met *Althen* prong three). By contrast, a temporal relationship between petitioner's preceding respiratory infection and her neurologic condition can be maintained regardless of whether the nausea and vomiting are attributable to the neurologic condition. (Tr. 174, 183-84, 236.)

In light of all of the above, and considering the record as a whole, I cannot conclude that there is preponderant evidence supporting a logical sequence of cause and effect implicating petitioner's flu vaccine as a cause of cerebellitis.

VI. Conclusion

There is no question that petitioner has suffered and that the events discussed throughout this decision profoundly affected her life. She has my sympathy, and I do not question her sincerity in bringing this claim. However, for all the reasons discussed above, I find that petitioner has not met her burden of proof in this case. Therefore, this case is dismissed.[16]

IT IS SO ORDERED.

s/Daniel T. Horner
Daniel T. Horner
Special Master

[16] In the absence of a timely-filed motion for review of this Decision, the Clerk of the Court shall enter judgment accordingly.